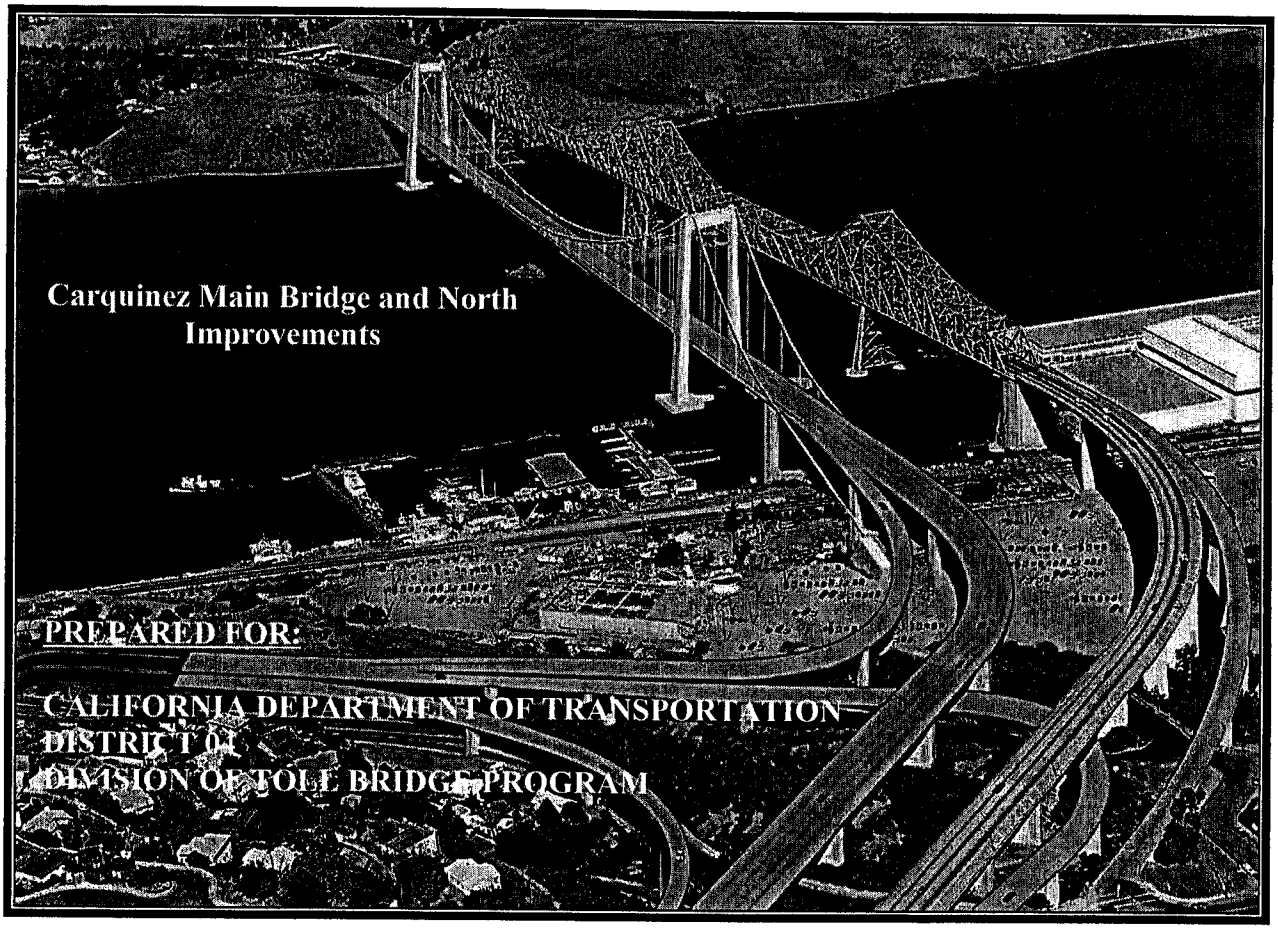
SITE INVESTIGATION REPORT



PREPARED BY:

CALIFORNIA DEPARTMENT OF TRANSPORTATION
DISTRICT 04
DIVISION OF TOLL BRIDGE PROGRAM
ENVIRONMENTAL ENGINEERING BRANCH
111 GRAND AVENUE
OAKLAND, CALIFORNIA

Caltrans

EA 013034
04-SOL-80 7.7/7.8
04-CC-80

July 1999

REPORT LIMITATIONS

This report has been prepared exclusively for Caltrans. The information herein is only valid as of the date of the report, and will require an update to reflect additional information obtained. The conclusions presented are based on the current regulatory climate and may require revision if future regulatory changes occur.

The findings and conclusions as presented in this report are predicted on the results of the limited sampling and laboratory testing performed. In addition, the information obtained is not intended to address potential impacts related to sources other than those specified herein. The report should only be deemed conclusive with respect to the information obtained.

The contents of this report reflect the views of the author who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State of California or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

CALIFORNIA DEPARTMENT OF TRANSPORTATION
DIVISION OF TOLL BRIDGE PROGRAM - ENVIRONMENTAL ENGINEERING BRANCH

Prepared by:

Michael Flake 7/30/99

Signature Date

Michael Flake, PE
Civil and Environmental Engineer

Approved by:

Allen Baradar 8/5/99

Signature Date

Allen Baradar, PE, REA
District Branch Chief

TABLE OF CONTENTS

LIST OF ACRONYMS

Caltrans	State of California – Department of Transportation
CCR	California Code of Regulations
CFR	Code of Federal Regulations
DUP	Duplicate
EPA	Environmental Protection Agency
LCS	Laboratory Control Spike
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NA	Not Analyzed
ppm	parts per million
ppt	part per trillion
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SFRWQCB	San Francisco Bay Regional Water Quality Control Board
STLC	Soluble Threshold Limit Concentration
TCLP	Toxicity Characteristic Leaching Procedure
TTLC	Total Threshold Limit Concentration
WET	Waste Extraction Test
yd^3	cubic yard
<	below detection limit

PROJECT TEAM

Contact	Affiliation	Responsibility
Allen Baradar, PE, REA Michael Flake, PE Gabriel Tcruz (510) 286-5636 (510) 286-5664 (510) 286-5587	Caltrans – District 4 Division of Toll Bridge Program Environmental Engineering Branch 111 Grand Avenue, 14th Floor Oakland, CA 94623	Contract Manager Assistant Contract Managers Project Planning and Coordination, Fieldwork, Site Investigation Report
Bill Kenney Chris Lonergan (925) 469-9750 (925)469-9749 fax	Geocon Environmental Consultants, Inc. 3235 Sunrise Blvd., Suite 6 Sacramento, CA 95742 (*Caltrans Contractor*)	Fieldwork, Sample Collection, Laboratory Assignments
Cheryl De Los Reyes (562) 989-4045 (562) 989-4040 fax	Advanced Technology Laboratories, Inc. 1510 East 33rd Street Signal Hill, CA 90807 (*Geocon Subcontractor*)	Sample Holding Laboratory Preparation Laboratory Analyses Laboratory QA/QC

EXECUTIVE SUMMARY

This Site Investigation Report presents the results of a limited soil investigation performed at the proposed anchorage locations for the new Carquinez Bridge. The areas investigated include the soils to be displaced at and adjacent to the proposed north and south anchorages.

The basic field procedures of this Site Investigation were to excavate borings, collect soil and water samples, and conduct laboratory analyses to characterize groundwater and soils impacted from heavy metals, petroleum hydrocarbons, and other organic compounds. The site of the investigation is depicted on Figure 1 - Vicinity Map.

Eight soil borings were driven at both the north and south anchorages. A total of 106 soil samples and 6 groundwater samples were collected and analyzed for the constituents of concern. Summarized below are the findings and conclusions regarding the investigation performed at the two anchorage locations:

South Anchorage

- Based on the analytical results, surface soils (0 to 1.8 meters below ground surface) in the vicinity of the south anchorage contain concentrations of soluble lead exceeding California regulatory limits (Title 22). Soils removed to depth of 6 feet (1.8 meters) should be excavated, stockpiled, and managed separately as a California hazardous waste. These stockpiled soils may be sampled and analyzed for lead in accordance with acceptable regulatory protocols to determine if the soil can be disposed at a landfill, other than a Class I facility. The excavation contractor(s) should be aware that per Section 25157.8 of the California Health and Safety Code, on or after January 1, 1999, no person shall dispose of waste that contains total lead in excess of 350 parts per million (ppm), copper in excess of 2500 ppm, or nickel in excess of 2000 ppm to land other than a Class I hazardous waste disposal facility.

- Based on the analytical results, sub-surface soils removed in excess of 1.8 meters below ground surface contain elevated concentrations of volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), such that the soils should be considered adequate for disposal at a Class II disposal facility. Some Class III facilities may have maximum allowable concentrations for VOCs and SVOCs that are above those detected in the soils.

- The total concentration for metals are consistent with the San Francisco Bay Regional Water Quality Control Board's Basin Plan, except for lead and mercury. However, the dissolved concentrations of the two metals in groundwater are unknown, therefore controls for removing solids from the discharge of groundwater may ensure that the concentration of lead and mercury are compatible with the receiving water body.

- Total Petroleum Hydrocarbons as diesel (TPHd) were detected in each of the 5 groundwater samples. TPHd was detected at 0.2 mg/L in four samples and 0.1 mg/L in one sample. As a

result, any discharges of groundwater should be prepared for treatment of petroleum hydrocarbons.

North Anchorage

- Based on the analytical results, the concentration of metals in the soils with the vicinity of the north anchorage do not exhibit any significant indication of exceeding the Title 22 criteria for regulating the soil as a California hazardous waste.

- The analyses of VOCs provided limited detectable results. The most significant results are for Acetone in soil samples measured at a minimum concentration of 54 µg/kg and a maximum concentration of 474 µg/kg. SVOCs were not detected in the samples obtained.

- The soil samples analyzed for TPHd did not produce any detectable results, but some detectable results were obtained for Total Petroleum Hydrocarbons as gasoline (TPHg). Although TPHg results were detected in less than 20% of the samples submitted for analysis, and the majority of these results are less than 25 µg/kg, petroleum hydrocarbons are anticipated to be present in the soils excavated based on the presence of former underground fuel tanks. One of the former tanks was located in the southeast portion of the excavation limits for the anchorage. Soil samples obtained in this investigation were not obtained within the vicinity of the tank due to limited access; however, any soil generated from the anchorage location should be suitable for disposal at a Class II facility. However, some Class III facilities may have maximum allowable concentrations for petroleum hydrocarbons found in the site soils.

- The total concentration of metals in groundwater are consistent with the San Francisco Bay Regional Water Quality Control Board's Basin Plan, except for lead and mercury. However, the dissolved concentrations of the two metals in groundwater are unknown, therefore controls for removing solids from the discharge of groundwater may ensure that the concentration of lead and mercury are compatible with the receiving water body.

- Petroleum hydrocarbons were not analyzed in groundwater samples. Previous groundwater sampling within the area detected diesel range hydrocarbons that resulted from the former on-site storage of underground fuel tanks. As a result, any discharges of groundwater should be prepared for treating petroleum hydrocarbons.

SITE INVESTIGATION

1.0 INTRODUCTION

This Site Investigation Report presents the results of a limited soil investigation performed at the proposed southern and northern anchorages for the new Carquinez Bridge. The new structure will be a suspension bridge used to replace the seismically unsafe 1927 Carquinez Bridge that supports traffic for westbound Interstate 80 (I-80). The location of the structure is depicted on Figure 1 – Vicinity Map. The areas investigated include the soils displaced and adjacent to the proposed concrete anchorage locations that will be used to affix the principal cables onto the shore.

1.1 Project Description and Proposed Improvements

The project is located on Route I-80, in both Contra Costa and Solano Counties, west of the existing Carquinez Bridges that span the Carquinez Strait. The south anchorage consists of an inclined concrete structure that is approximately 43.5 meters wide and 48.0 meters long. The south anchorage is depicted in Figures 2 and 3. The south anchorage is anticipated to protrude to a maximum depth of 9.0 meters into the ground. The south anchorage will be further secured with forty-nine, 750 mm Cast in Steel Shell (CISS) Piles. Each pile will most likely be driven to a desired depth where it will be secured to a foundation of rock. The north anchorage and the abutment, as shown in Figures 2 and 3, will be a stepped structure that will mostly be located below the soil surface. The stepped structure is approximately 48.0 meters long and 36.6 meters wide. The stepped structure is anticipated to protrude to a maximum depth of approximately 20.8 meters into the ground.

1.2 Purpose

Documented sources of metal impacts near the north and south anchorage locations include, but are not limited to, sandblasting residues of lead paint and aerially deposited lead from vehicle emissions. Other documented sources of contamination include petroleum hydrocarbons from former underground fuel tanks within the Carquinez Bridge Maintenance Facility; volatile and semi-volatile organic constituents from the storage, handling, and use of paint and paint removal chemicals at the maintenance facility; heating oil impacts due former home heating oil tanks near the south anchorage location; and volatile organic constituents and heavy metals within the soil and groundwater at the south anchorage due to multiple industrial activities in the vicinity of the south anchorage.

The objective of this investigation is to determine if contaminated or hazardous materials are present within the soils, due to the impacts described. This work was accomplished by collecting soil and groundwater samples through intrusive soil drilling and performing laboratory analyses on the samples collected. The results of this investigation will be used to evaluate health and safety issues; soil re-use options; and appropriate soil disposal requirements.

2.0 BACKGROUND

"The west Carquinez Bridge is nearly 70 years old and does not meet current seismic safety standards for transportation facilities. Bridge roadway and approach geometrics are also deficient. Upgrading bridge roadway and approach structures to satisfy current seismic standards and design criteria would ensure the continuation of the crossing, improve safety, and address current and expected future travel demand."[1] As a result, the bridge will be replaced with a new suspension bridge that will be located approximately 29 meters to the west of the existing 1927 bridge.

2.1 Hazardous Waste Determination Criteria

Regulatory criteria to classify a waste as "California hazardous" for handling and disposal purposes are contained in the *California Code of Regulations* (CCR), Title 22, Division 4.5, Chapter 11, Article 3, 66261.24. Criteria to classify a waste as "Resource, Conservation, and Recovery Act (RCRA) hazardous" are contained in Chapter 40 of the Code of Federal Regulations (40 CFR), Section 261.

For a waste containing metals, the waste is classified as "California hazardous" when its: 1) total metal content exceeds the Total Threshold Limit Concentration (TTLC); or 2) soluble metal content exceeds the Soluble Threshold Limit Concentration (STLC) based on the Waste Extraction Test (WET) analysis. A material is classified as "RCRA hazardous" when its soluble metal content exceeds the Federal Regulatory Level based on Toxicity Characteristic Leaching Procedure (TCLP).

The above regulatory criteria are based on toxicity. Wastes may also be classified as hazardous based on other criteria such as corrosivity and ignitability. However, for the purpose of this investigation, toxicity (i.e. metals concentration) is the primary factor considered for waste classification. Waste that is classified as either "California hazardous" or "RCRA hazardous" requires management as a hazardous waste and disposal to an approved disposal facility.

3.0 SCOPE OF SERVICES

The scope of services for this project includes site meetings, on-site fieldwork, laboratory analyses, and preparation of this Site Investigation Report as described as follows:

[1] Final Environmental Impact Statement/Statutory Exemption, I-80 Carquinez Bridge Project, Caltrans, January 1998

3.1 Pre-Field Activities

- Conducted a pre-work site visit on June 2, 1998 to locate and inspect the work areas and determine the feasibility of proposed sample locations. The meeting was attended by Bill Kinney of Geocon and Michael Flake of Caltrans.

- Retained the services of Geocon Environmental Consultants, Inc. to perform sample collection and laboratory assignments.

- A health and safety plan was developed by Geocon for the proposed field activities. The health and safety plan provided guidelines on the use of personal protective equipment and the health and safety procedures implemented during the field activities.

- Geocon obtained a Contra Costa County Environmental Health Division boring permit (Permit No. 98-0437) in May 1998.

- Geocon contacted the local public utilities via Underground Service Alert and reviewed utility plans, in order to locate and delineate subsurface public and private utilities within the proposed investigation areas.

- Geocon retained the services of V&W Drilling, a California-approved and California licensed drilling contractor, to perform the drilling work; and Advanced Technology Laboratories (ATL), a California certified hazardous materials testing laboratory (ELAP No. 1838), to perform soil and groundwater analyses.

3.2 Field Activities

The fieldwork for this project was performed under the direct supervision of Geocon's field supervisor and/or Project Manager. Exploratory boring locations are depicted on Figures 2, 4, and 5.

- A total of 16 borings were advanced within the locations under investigation. Eight borings were located at the south anchorage location and another eight borings were located at the north anchorage location.
- The north anchorage borings were advanced using hallow-stem auger drilling methods, while south anchorage borings were advanced using direct-push drilling methods.
- Groundwater samples were collected from boring B-2 at the north anchorage, and were collected from borings B-1, B-5, B-6, B-7, and B-8 at the south anchorage.
- Soil and groundwater samples were containerized, labeled, placed in a cooler of ice, and transported to ATL for chemical analyses under standard chain-of-custody procedures. Laboratory analyses was requested on either a 48-hour turn-around-time (TAT) or a standard TAT basis.
- The borings were logged under the supervision of a California Registered Geologist utilizing the Unified Soil Classification System. Prior to, and following each use of the sampling equipment, the equipment was decontaminated with an Alconox wash solution and rinsed

with tap water and a final rinse with distilled water. Pre-cleaned hollow-stem auger flights were used at each boring location at the north anchorage. All wash water and solutions were disposed within 55-gallon drums or 20 cubic yard roll-off bins for which the contents were later disposed at a permitted facility.

- Upon completion of the soil/groundwater sampling, the borings were backfilled to surface grade with bentonite grout.
- Soil cuttings and decontamination wash water generated during the field activities were containerized and stored on-site for future disposal.

4.0 INVESTIGATIVE METHODS

The rationale and method of investigation for the sampling procedures and protocols and laboratory analyses are discussed below.

4.1 Soil Sampling

At boring locations for the north anchorage, all borings were advanced using a truck mounted hollow-stem auger drill rig. Soil samples were collected utilizing a 50.8-mm (2-inch) diameter split spoon sampler equipped with 152.4-mm long by 50.8-mm diameter (6-inch by 2-inch diameter) stainless steel samples tubes to facilitate sample handling and storage.

At boring locations for the south anchorage, all borings were advanced using a truck mounted direct-push drill rig. The soil samples were collected utilizing a direct-push percussion hammer to drive sample barrels lined with a plastic sleeve to facilitate sample handling and storage. Upon retrieval of the continuous core sample, the plastic sleeve was cut into sections corresponding with the desired sampling depths.

The plastic sleeve sections or stainless steel sample tubes were fitted with Teflon sheets on each end, capped, labeled, placed in a chilled cooler, and transported to ATL under standard chain-of-custody procedures. The borings were logged according to the USCS. Boring logs are included in Appendix B.

Boring depths ranged from 10 to 50 feet (3.05 to 15.2 meters) below ground surface. The actual sampling depths for each boring are summarized in Section 5. Cuttings, drilling fluids, and decontamination washings were stored on-site in 55-gallon drums or 20 cubic yard roll-off bins pending the receipt of analytical data and subsequent disposal following regulatory protocol.

4.2 Groundwater Sampling

At the north anchorage location, boring B-2 was selected for obtaining grab groundwater samples. These samples were obtained after having identified significant groundwater within the boring. Upon encountering the groundwater, temporary PVC casing was placed into the boring and groundwater was allowed to recharge. Groundwater samples were then collected from the boring utilizing a pre-cleaned disposable bailer. Groundwater samples were placed in appropriate laboratory provided containers, labeled, placed in a chilled cooler, and transferred to

ATL under standard chain-of-custody procedures. The depth to groundwater in the boring sampled was 36 feet (10.97 meters).

At the south anchorage location, borings B-1, B-5, B-6, B-7, and B-8 were selected for obtaining grab groundwater samples. These samples were obtained after having identified significant groundwater within the boring. Upon encountering the groundwater, a pre-cleaned, temporary bailer was placed through the sampling barrel to obtain the sample. Groundwater samples were placed in appropriate laboratory provided containers, labeled, placed in a chilled cooler, and transferred to ATL under standard chain-of-custody procedures. The depth to groundwater of the borings sampled ranged from 3.5 to 5.0 feet (1.07 to 1.52 meters).

4.3 Laboratory Analyses

Soil Samples were submitted to the laboratory for the analysis of CCR Title 22 metals following EPA Test Method 6010 under normal turn-around-time. Soil samples that contained a total concentration of at least ten times the soluble threshold limit concentration (STLC) established within Title 22 of the California Code of Regulations were further analyzed by the waste extraction test (WET). Soil samples that exceed the total threshold limit concentration (TTLC) or STLC were analyzed using the toxicity characteristic leaching procedure (TCLP) following EPA Test Method 1311.

Also, soil samples were submitted to the laboratory for the following analyses under normal turn-around-time:

- Volatile Organic Compounds (VOCs) following EPA Test Method 8240.
- Semi-Volatile Organic Compounds (SVOCs) following EPA Test Method 8270.
- Total Petroleum Hydrocarbons as Gasoline (TPHg) following modified EPA Test Method 8015.
- Total Petroleum Hydrocarbons as Diesel and Motor Oil (TPHd and TPHmo, respectively) following EPA Test Method 8015B.

Water samples obtained from Boring B-2 for the North Anchorage were analyzed for total Title 22 metals following EPA Test Method 6010/7471. Water samples obtained for the South Anchorage were analyzed for the following:

- Title 22 metals (total) following EPA Test Method 6010/7471.
- Volatile Organic Compounds (VOCs) following EPA Test Method 8240.
- Semi-Volatile Organic Compounds (SVOCs) following EPA Test Method 8270.
- Total Petroleum Hydrocarbons as Gasoline (TPHg) following modified EPA Test Method 8015.
- Total Petroleum Hydrocarbons as Diesel and Motor Oil (TPHd and TPHmo, respectively) following EPA Test Method 8015B.

The Quality Assurance/Quality Control (QA/QC) procedures were performed with specificity for each analyte listed in the test method's QA/QC. The laboratory QA/QC procedures include the following:

- One method blank for every ten samples, batch of samples, or type of matrix, whichever is more frequent.
- One sample analyzed in duplicate for every ten samples, batch of samples, or type of matrix, whichever is more frequent.
- One spiked sample for every ten samples, batch of samples or type of matrix, whichever if more frequent, with spike made at ten times the detection limit or at the analyte level.

Prior to submitting the soil and groundwater samples to the laboratory, the chain-of-custody documentation was reviewed for accuracy and completeness. All samples were preserved at 4° C within sealed ice chests and submitted to the laboratory within proper holding times. The laboratory reports were also reviewed for accuracy and consistency with the chain-of-custody documentation. In addition, the laboratory QA/QC summary reports were reviewed to determine if the laboratory results are within tolerance control limits. Based upon this review process, the data quality appears to be adequate. The results of the QA/QC analyses conducted are presented in Appendix A.

5.0 INVESTIGATION RESULTS AND FIELD OBSERVATIONS

A summary of the analytical laboratory test results for total and soluble CCR Title 22 metals are presented in Table 1 and Table 2 for the north and south anchorages respectively. A summary of significant laboratory results of all analyses, as described in Section 4.3, are depicted in the summary diagrams presented in Figures 4 and 5 for the north and south anchorages respectively. Copies of the laboratory reports and chain-of-custody documentation for the soil and water samples are included in Appendix A.

5.1 South Anchorage

Twelve soil samples exhibited total lead concentrations greater than ten times the STLC value. Eleven of these samples were subsequently analyzed for soluble lead via the WET method. Three of these samples exhibited soluble lead concentrations greater than the STLC of 5.0 mg/L for lead. All eleven soil samples were additionally analyzed for soluble lead via the TCLP and exhibited soluble lead concentrations less than the regulatory thresholds. The summary of analytical laboratory results for metals are presented in Table 1.

The one soil sample that was not analyzed by the WET method was a sample that contained selenium. The sample was obtained at the maximum sampling depth of 46 feet (14 meters). The sample was not considered significant in predicting the waste classification of the soil because other samples did not produce similar results and the data appeared to be deeply isolated within the proposed excavation for the anchorage.

Groundwater samples were obtained from five different borings and analyzed for each of the Title 22 metals (total) in accordance with EPA Method 6010. The laboratory results for each of the metals are compared to the Water Quality Objectives defined in the San Francisco Bay Regional Water Quality Control Board's Basin Plan for surface waters with salinities greater than 5 parts per trillion (ppt). These values are considered for comparison because it is assumed

that groundwater generated during construction operations would be disposed to the Carquinez Strait. Most of the constituents are consistent with the objectives; however, all results for lead in groundwater exceeded either one or both of the water quality objectives. One of the results for mercury exceeded the water quality objectives. Although the other four results for mercury were below laboratory detection limits, the objectives for mercury are extremely small, such that a determination as to whether the objectives are exceeded could not be established. The groundwater results for metals, along with the water quality objectives for metals, are depicted in Table 3.

Of the 57 soil samples submitted for analysis of VOCs, 24 samples produced detectable results for various analytes included in EPA Method 8240. The constituents detected include acetone at a maximum concentration of 1200 µg/kg, carbon disulfide at a maximum concentration of 57 µg/kg, and methylene chloride at a maximum concentration of 87µg/kg. A summary of the analytical laboratory results for VOCs are presented in Table 2. VOCs were not detected in any of the groundwater samples obtained.

Of the 58 soil samples submitted for analysis of SVOCs, 8 samples produced detectable results of phenol. The concentrations of phenol ranged between a minimum of 351 µg/kg to a maximum of 670 µg/kg. A summary of the analytical laboratory results for SVOCs are presented in Table 2. SVOCs were not detected in any of the groundwater samples obtained.

Of the 29 soil samples submitted for analysis of TPHg, only 4 samples produced detectable results of the analytes included in EPA Method 8015M. The constituents detected include toluene at a maximum concentration of 6.0 µg/kg, ethylbenzene at a maximum concentration of 5 µg/kg, and total xylenes at a maximum concentration of 18µg/kg. A summary of the analytical laboratory results for TPHg in groundwater are presented in Table 3. TPHg was not detected in any of the groundwater samples submitted for analyses.

A composite soil sample from each boring was analyzed for TPHd and TPHmo for a total of 8 samples submitted for laboratory analyses. Each of the samples did not produce a detectable result. Each of the groundwater samples submitted for analyses of TPHd did produce a detectable result; however, the results were beyond the diesel range and reflective of a heavier petroleum hydrocarbon (i.e. motor oil range). Four of the five results were at a concentration of 200 µg/L with a single result of 100 µg/L. A summary of the analytical laboratory results for TPHd in groundwater are presented in Table 3.

5.2 North Anchorage

Only one soil sample exhibited total chromium concentrations greater than ten times the STLC value. The sample was at depth of 0.5 feet (0.15 meters) below ground surface. Although the soil sample should have been further analyzed under the WET, the analysis was not conducted due to the overwhelming amount of data that did not exceed or potentially exceed Title 22 threshold limit concentrations. The sample was not considered significant in predicting the waste classification of the soil. The summary of the analytical laboratory results for metals are presented in Table 4.

Groundwater samples were obtained from one boring and analyzed for each of the Title 22 metals (total) in accordance with EPA Method 6010. The laboratory results for each of the metals are compared to the Water Quality Objectives defined in the San Francisco Bay Regional Water Quality Control Board's Basin Plan for surface waters with salinities greater than 5 ppt. All of the constituents are consistent with the objectives, except for lead and mercury. The lead result exceeded the objectives for the 4-day average only. The results for mercury are below laboratory detection limits, but the objectives for mercury are extremely small, such that a determination as to whether the objectives are exceeded could not be established. The groundwater results for metals, along with the water quality objectives for metals, are depicted in Table 6.

Of the 48 soil samples submitted for analysis of VOCs, 5 samples produced detectable results for various analytes included in EPA Method 8240. The constituents detected include acetone at a maximum concentration of 474 µg/kg, and 1,1-dichloroethene at a maximum concentration of 5.2 µg/kg. A summary of the analytical laboratory results for VOCs are presented in Table 5.

Of the 48 soil samples submitted for analysis of SVOCs, no sample produced detectable results of the various analytes included in EPA Method 8270. A summary of the analytical laboratory results for SVOCs are presented in Table 5.

Of the 26 soil samples submitted for analysis of TPHg, only 5 samples produced detectable results of the analytes included in EPA Method 8015M. The constituents detected include toluene at a maximum concentration of 31 µg/kg, ethylbenzene at a maximum concentration of 8.6 µg/kg, and total xylenes at a maximum concentration of 299µg/kg. A composite soil sample from each boring was analyzed for TPHd for a total of 8 samples submitted for laboratory analyses. Each of the samples did not produce a detectable result. A summary of the analytical laboratory results for petroleum hydrocarbons are presented in Table 5.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 South Anchorage

Surface soils with the proposed excavation limits of the anchorage contain elevated concentrations of soluble lead above Title 22 waste threshold values. 50% of the borings contained a sample that exceeded the Title 22 criteria; however, none of these samples were obtained at or below a depth of 6 feet (1.8 meters). Soils removed to depth of 6 feet (1.8 meters)

should be excavated, stockpiled, and managed separately as a California hazardous waste. These stockpiled soils may be sampled and analyzed for lead in accordance with acceptable regulatory protocols to determine if the soil can be disposed at a landfill, other than a Class I facility. The excavation contractor(s) should be aware that per Section 25157.8 of the California Health and Safety Code, on or after January 1, 1999, no person shall dispose of waste that contains total lead in excess of 350 ppm, copper in excess of 2500 ppm, or nickel in excess of 2000 ppm to land other than a Class I hazardous waste disposal facility.

VOCs were detected in each of the borings at variable depths; however, the concentrations did not venture above 247 µg/kg. The presence of SVOCs was not as predominant as that for VOCs. The only SVOC detected was phenol, it was detected in four of the eight borings at an average of 520 µg/kg for those samples and duplicate samples with detectable results. The phenol results are well below the Residential and Industrial Preliminary Remediation Goals of 33,000 mg/kg and 100,000 mg/kg respectively. TPH results were detected for gasoline range hydrocarbons, but these results are not very significant, whereas only 4 of the 29 samples produced a detectable result. The soils below a depth of 6 feet (1.8 meters) should be suitable for disposal at a Class II facility. Some Class III facilities may have maximum allowable concentrations for VOCs, SVOCs, and TPH that are above those detected in the soils.

The total concentration for lead and mercury in groundwater may not be compatible with the objectives defined in the SFBRWQCB's Basin Plan. However, the dissolved concentrations of the two metals in groundwater are unknown, therefore controls for removing solids from the discharge of groundwater may ensure that the concentration of metals are compatible with the receiving water body. TPHg was not detected in the groundwater samples; however, TPHd was detected each of the 5 samples. TPHd was detected at 0.2 mg/L in four samples and 0.1 mg/L in one sample. All of the TPHd results did not match a diesel pattern, but petroleum hydrocarbons are present in the groundwater. As a result, any discharges of groundwater should be prepared for treatment of petroleum hydrocarbons.

The excavation contractor(s) should prepare a comprehensive health and safety plan for construction activities scheduled to occur within the project boundaries defined in this Site Investigation Report which includes discussion of the constituents of concern, routes of exposure, permissible exposure limits, and personal protective measures. The health and safety plan should be reviewed and signed by the on-site construction workers prior to any field activities.

6.2 North Anchorage

Metals analyses for the samples obtained did not exhibit any significant indication of exceeding the Title 22 criteria for regulating the soil as a California hazardous waste. The only potential indication was the total chromium result for a sample obtained at a depth of 2.0 feet (0.6 meters) below ground surface from boring B-8. The result indicates that the sample may exceed the STLC for chromium, but the confirmation analysis for this sample was not completed to prove otherwise. However, the overwhelming amount of data obtained from other samples for the north anchorage does not characterize the soil as being hazardous.

The analyses of VOCs provided limited detectable results. The most significant results are the detection of acetone within 4 of the 48 soil samples obtained. Acetone was measured at a minimum concentration of 54 µg/kg and a maximum concentration of 474 µg/kg for the soil samples. The presence of acetone might be associated with the handling or storage of chemicals used in the removal of paint. Detectable results were not obtained for SVOCs. The soil samples analyzed for TPHd did not produce any detectable results, but some detectable results were obtained for TPHg. Although, TPHg results were detected in less than 20% of the samples submitted for analysis, and the majority of these results are less than 25 µg/kg, petroleum hydrocarbons are anticipated to be present in the soils excavated based on the presence of former underground fuel tanks. One of the former tanks was located in the southeast portion of the excavation limits for the anchorage. Soil samples obtained in this investigation were not obtained with the vicinity of the tank due to limited access; however, Geocon's March 1999 report[2] should be consulted for this information.

Based on both the results and the presence of former underground fuel tanks within or near the proposed anchorage excavation, the soils should be suitable for disposal at a Class II facility. However, some Class III facilities may have maximum allowable concentrations for VOCs and TPHg that are above those detected in the soils.

The total concentration for lead and mercury in groundwater may not be compatible with the objectives defined in the SFBRWQCB's Basin Plan. However, the dissolved concentrations of the two metals in groundwater are unknown, therefore controls for removing solids from the discharge of groundwater may ensure that the concentration of metals are compatible with the receiving water body. Although, petroleum hydrocarbons were not analyzed in groundwater samples, previous groundwater sampling within the area, as described in Geocon's June 1999 report[3], had detected diesel range hydrocarbons that resulted from the former on-site storage of underground fuel tanks. As a result, any discharges of groundwater should be prepared for treating petroleum hydrocarbons.

The excavation contractor(s) should prepare a comprehensive health and safety plan for construction activities scheduled to occur within the project boundaries defined in this Site Investigation Report which includes discussion of the constituents of concern, routes of exposure, permissible exposure limits, and personal protective measures. The health and safety plan should be reviewed and signed by the on-site construction workers prior to any field activities.

[2] Underground Storage Tank Removal Report, Carquinez Bridge Maintenance Station, Geocon, March 1999.
[3] Site Investigation Report, Carquinez Main Bridge and North Approach Improvements, Geocon, June 1999.

FIGURE 1

VICINITY MAP

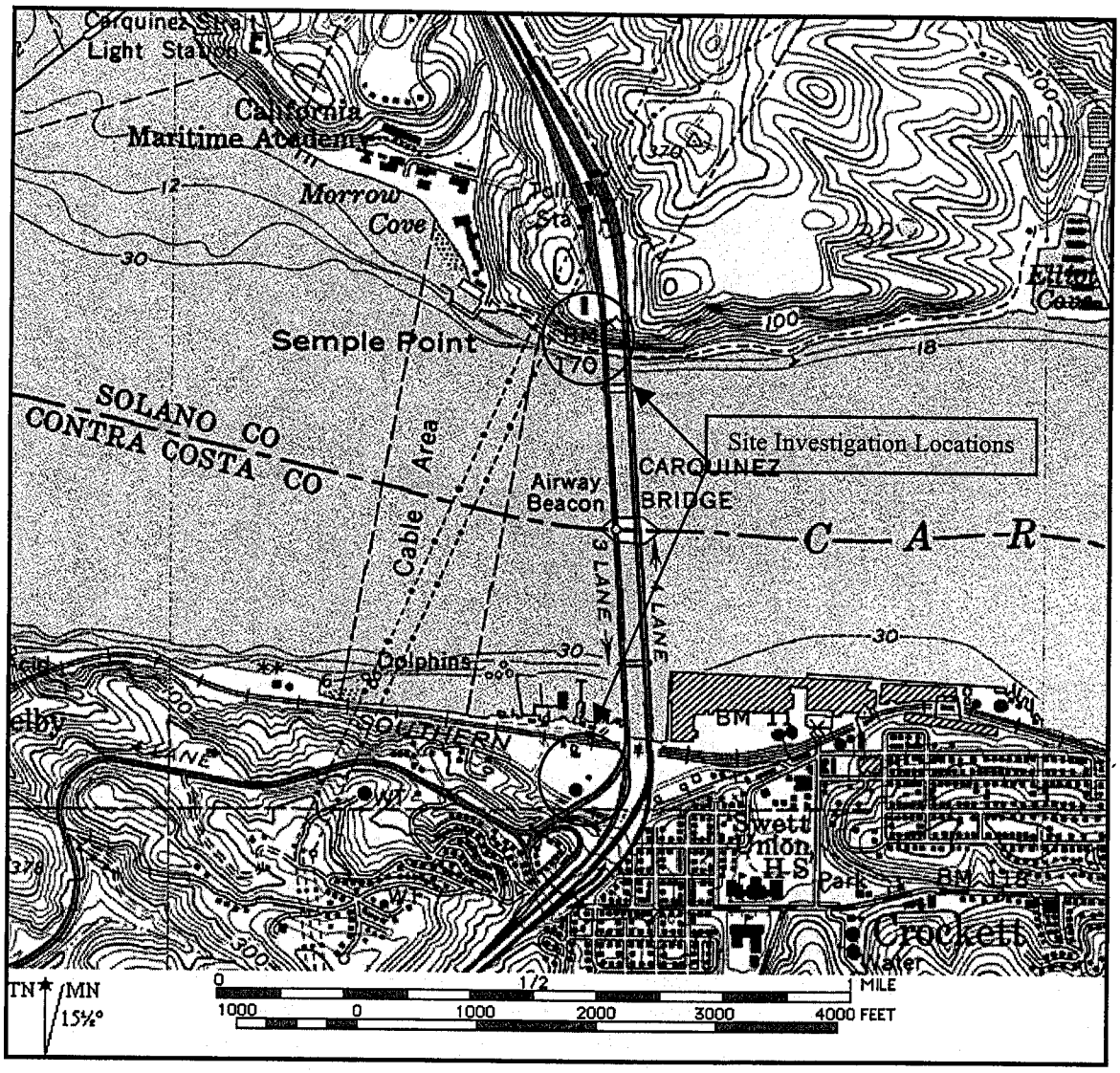
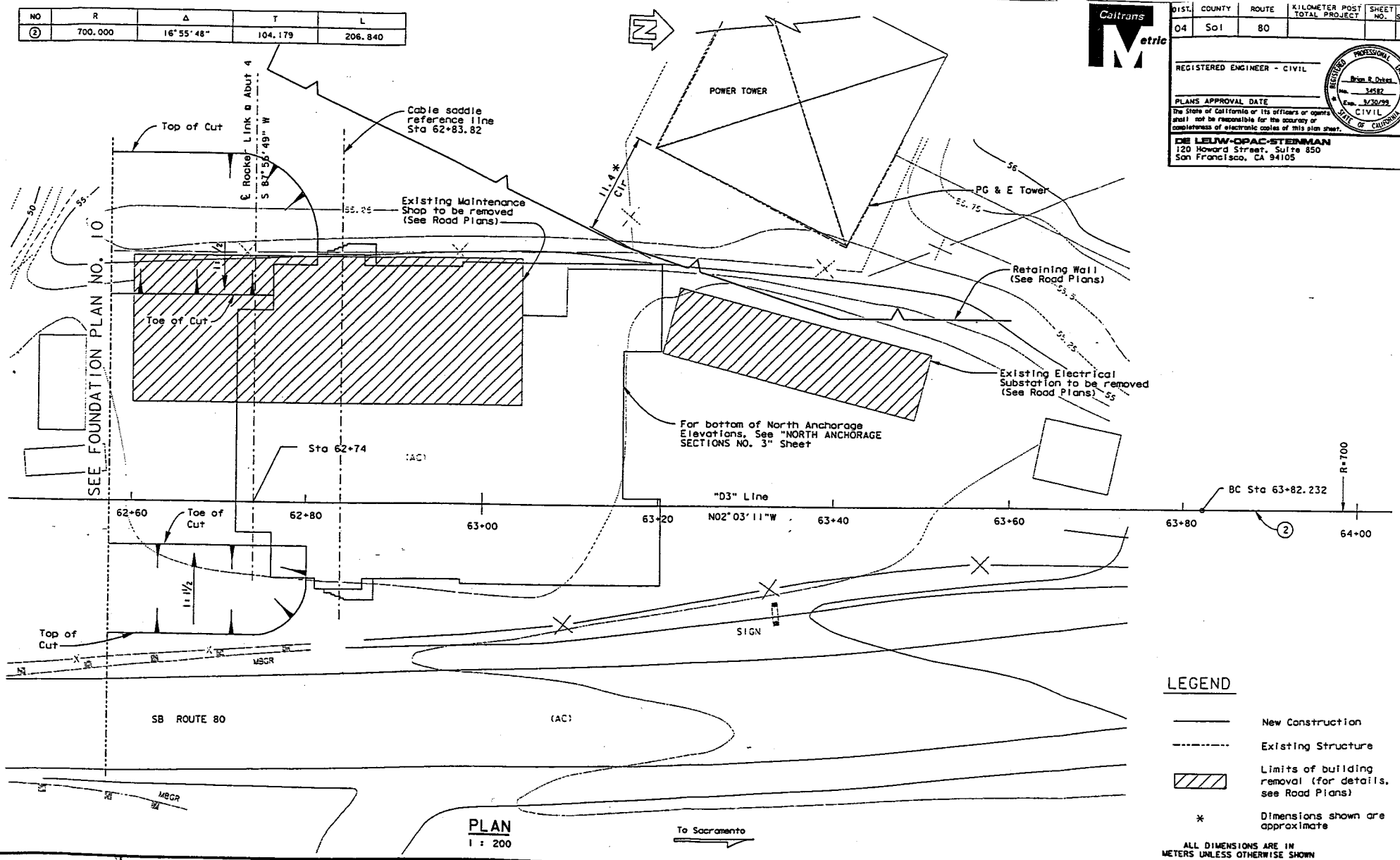

Carquinez Strait
Light Station
California
Maritime Academy
Morrow
Cove
Semple Point
SOLANO CO
CONTRA COSTA CO
Cable Area
Airway
Beacon
CARQUINEZ
BRIDGE
Site Investigation Locations
C A R
3 LANE
4 LANE
Dolphins
SOUTHERN
PACIFIC
Swett
mon
H S
Park
Crockett
Water
BM 11
BM 118
TN
MN
15½°
0
1/2
MILE
1000
0
1000
2000
3000
4000 FEET

FIGURE 2

SITE PLAN

NO	R	Δ	T	L
②	700.000	16°55'48"	104.179	206.840



PLAN
1 : 200

LEGEND

- New Construction
- Existing Structure
- Limits of building removal (for details, see Road Plans)
- * Dimensions shown are approximate

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DIST.	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	Sol	80			

REGISTERED ENGINEER - CIVIL

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED PROFESSIONAL ENGINEER — Brian R. Dykes — No. 34582 — Exp. 9/30/99 — CIVIL — STATE OF CALIFORNIA

DE LEUW-OPAC-STEINMAN
120 Howard Street, Suite 850
San Francisco, CA 94105

V. Castoni — DESIGN OVERSIGHT — SIGN OFF DATE — Rev. Dates 6-2-97

PHOTOGRAMMETRY AS OF: — SURVEYED — FIELD CHECKED

DRAWN — TRACED — CHECKED

DESIGN G. Orsolini — DETAILS H. Gawlu — QUANTITIES G. Orsolini — CHECKED J. Quincy — CHECKED J. Quincy — CHECKED R. Bateman

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

G. Orsolini — PROJECT ENGINEER
T. Sooth — BRIDGE DESIGN MANAGER

CU 04
EA 013031

BRIDGE NO. 28-0352L
KILOMETER POST 0.01

CARQUINEZ BRIDGE & OVERHEAD
FOUNDATION PLAN NO. 11

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

DISREGARD PRINTS BEARING EARLIER REVISION DATES

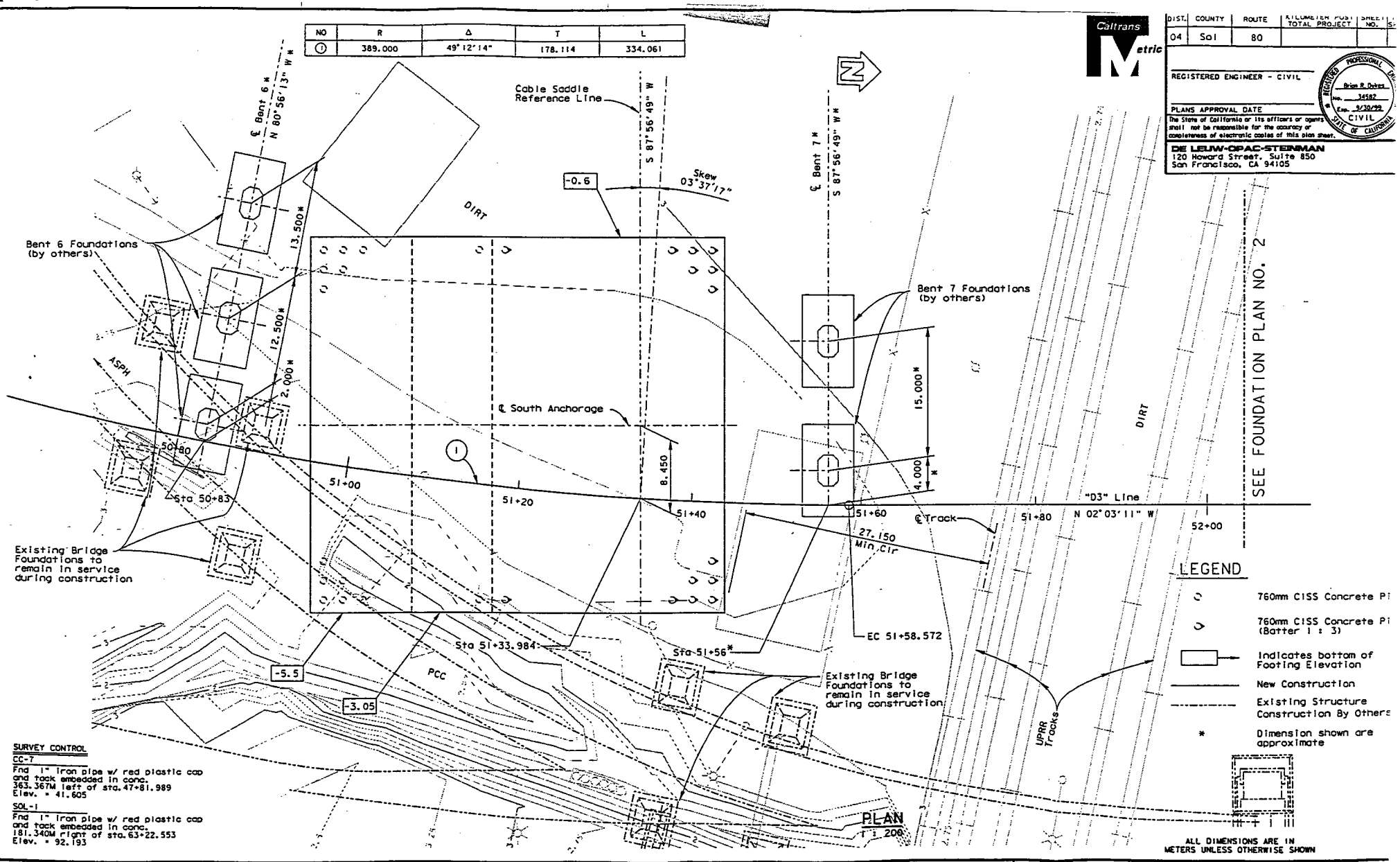
REVISION DATES (PRELIMINARY STAGE ONLY) 4/24/98 8/18/98 12/24/98 1/21/99 7/15/99

SHEET 22 OF 348

FILE => P:\64817\drawings\struct.dgn

PEN TABLE=>817ca.tbl

NO	R	Δ	T	L
①	389.000	49°12'14"	178.114	334.061



SURVEY CONTROL

CC-7
Fnd 1" iron pipe w/ red plastic cap and tack embedded in conc.
363.367M left of sta. 47+81.989
Elev. = 41.605

SOL-1
Fnd 1" iron pipe w/ red plastic cap and tack embedded in conc.
181.340M right of sta. 63+22.553
Elev. = 92.193

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DIST.	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO.	S-
04	Sol	80			

REGISTERED ENGINEER - CIVIL

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

Brian R. Ostrom
No. 34582
Exp. 9/30/99
CIVIL
STATE OF CALIFORNIA

DE LEUW-CPAC-STEINMAN
120 Howard Street, Suite 850
San Francisco, CA 94105

V. Gastoni	PHOTOGRAMMETRY AS OF:		DRAWN	BY	DESIGN	BY G. Orsolini	CHECKED J. Quincy
DESIGN OVERSIGHT	SURVEYED	BY	TRACED	BY	DETAILS	BY N. Gawlik	CHECKED J. Quincy
SIGN OFF DATE	FIELD CHECKED	BY	CHECKED	BY	QUANTITIES	BY G. Orsolini	CHECKED R. Bateman

PREPARED FOR THE STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

G. Orsolini
PROJECT ENGINEER
T. Spath
BRIDGE DESIGN MANAGER

CU 04
EA 013031

BRIDGE NO. 28-0352L
KILOMETER POST 0.01

CARQUINEZ BRIDGE & OVERHEAD
FOUNDATION PLAN NO. 1

SHEET 12

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

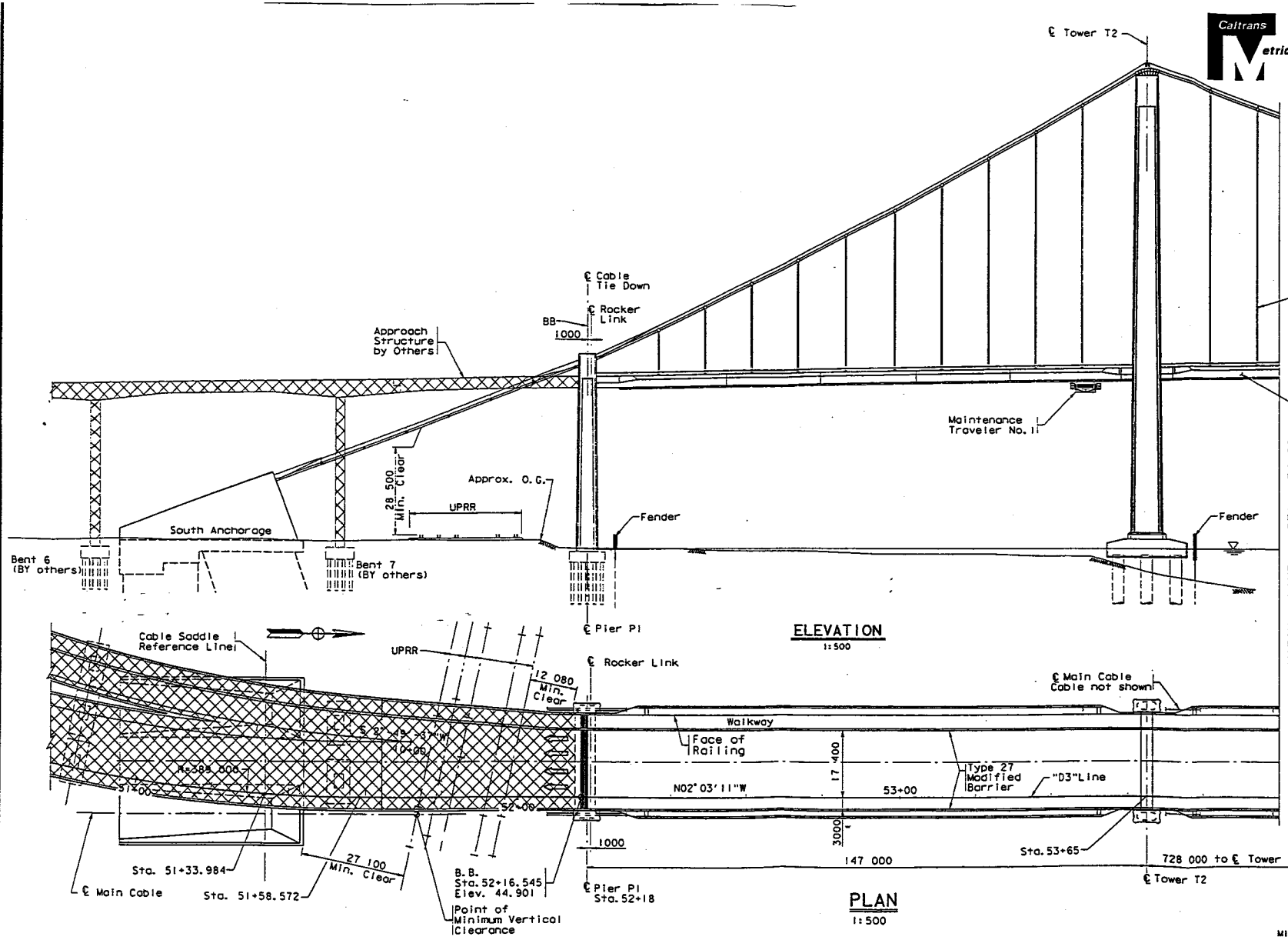
(FILE = J:\51641817\drawings\ctnd01.dgn)

PEN TABLE=3817dd.tbl

Rev. Dates 6-2-97

FIGURE 3

SITE PROFILE



ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

DIST	COUNTY	ROUTE	TOTAL PROJECT	PROJECT NO.	TOTAL SHEETS
04	Sol	80			

REGISTERED ENGINEER - CIVIL

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED PROFESSIONAL ENGINEER BRIAN R. DYKES No. 34587 Exp. 9/30/99 CIVIL STATE OF CALIFORNIA

DE LEUW-OPAC-STEINMAN
120 Howard Street, Suite 850
San Francisco, CA 94105

V. Gostoni
DESIGN OVERSIGHT

SIGN OFF DATE

Rev. Date: 6-2-97

	BY	CHECKED
DESIGN	D. Knczem	C. Orsolini
DETAILS	G. Jimenez	C. Orsolini
QUANTITIES	S. Candell	C. Orsolini

PREPARED FOR THE STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

D. Knczem
PROJECT ENGINEER
T. Spoth
BRIDGE DESIGN MANAGER

BRIDGE NO. 28-0352L
KILOMETER POST 0.01

CARQUINEZ BRIDGE & OVERHEAD
STRUCTURE PLAN NO. 1

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 04
EA EA 013031

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

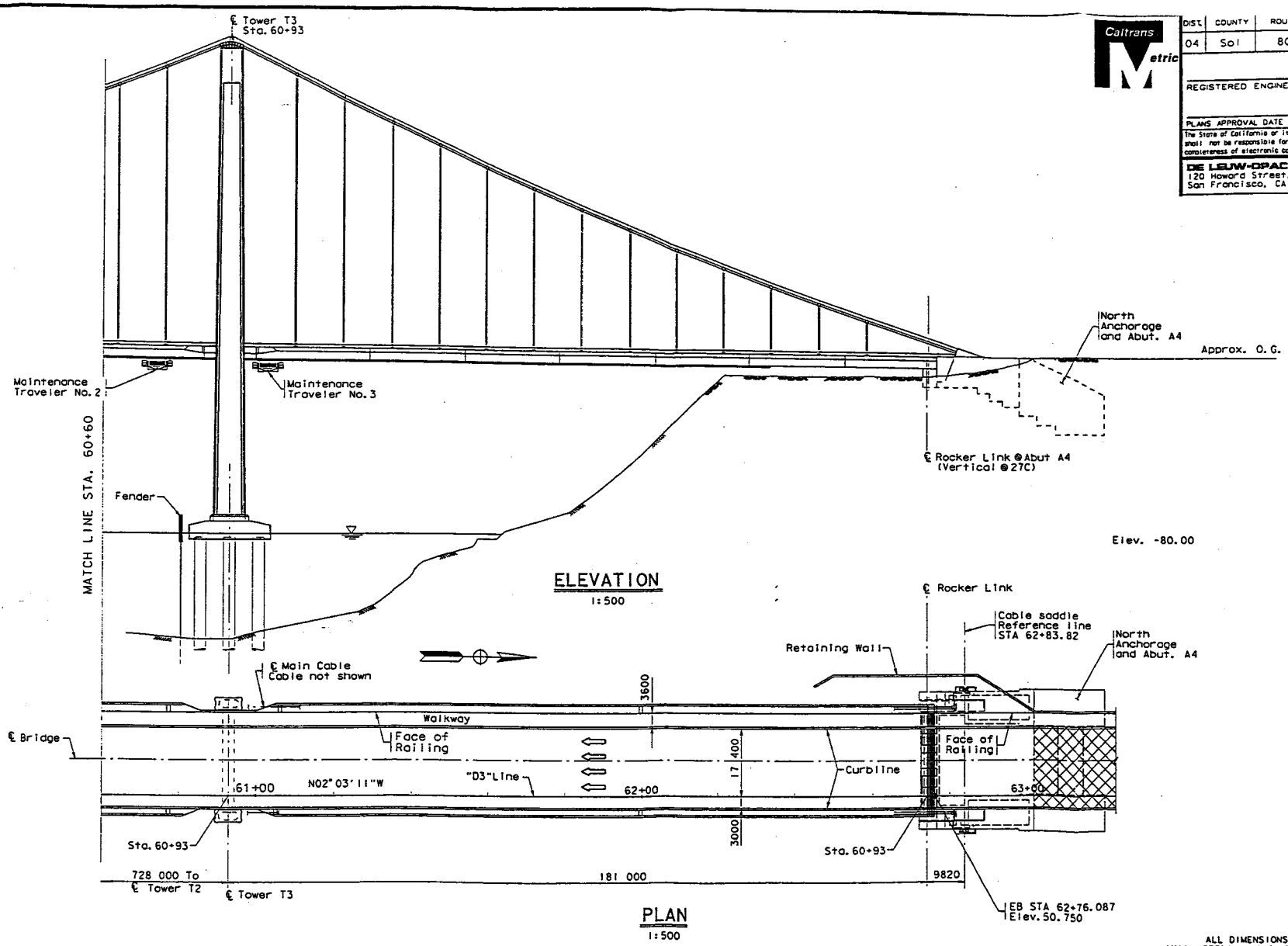
SHEET 6 OF 348

FILE => $REQUEST

DGN: S

DATE PLOTTED => $DATE

TIME PLOTTED => $TIME



Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	Sol	80			

REGISTERED ENGINEER - CIVIL

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED PROFESSIONAL ENGINEER — BRIAN R. DYKES — No. 34582 — Exp. 9/30/99 — CIVIL — STATE OF CALIFORNIA

DE LEUW-CPAC-STEINMAN
120 Howard Street, Suite 850
San Francisco, CA 94105

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

V. Gastoni		DESIGN	BY D. Khazem	CHECKED G. Orsolini	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION
IN OVERSIGHT		DETAILS	BY G. Jimenez	CHECKED G. Orsolini	D. Khazem, PROJECT ENGINEER; T. Spoth, BRIDGE DESIGN MANAGER
OFF. DATE		QUANTITIES	BY S. Concell	CHECKED G. Orsolini	BRIDGE NO. 28-0352L; KILOMETER POST 0.01

CARQUINEZ BRIDGE & OVERHEAD
STRUCTURE PLAN NO. 4

CU 04
EA EA 0I3031

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 9 OF 348

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

DATE PLOTTED => 8/18/98 TIME PLOTTED => 07:45

FIGURE 4

BORING LOCATION PLANS WITH SIGNIFICANT LABORATORY RESULTS SOUTH ANCHORAGE

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	CC SOL	80	20.6/22.7 0.0/3.5		

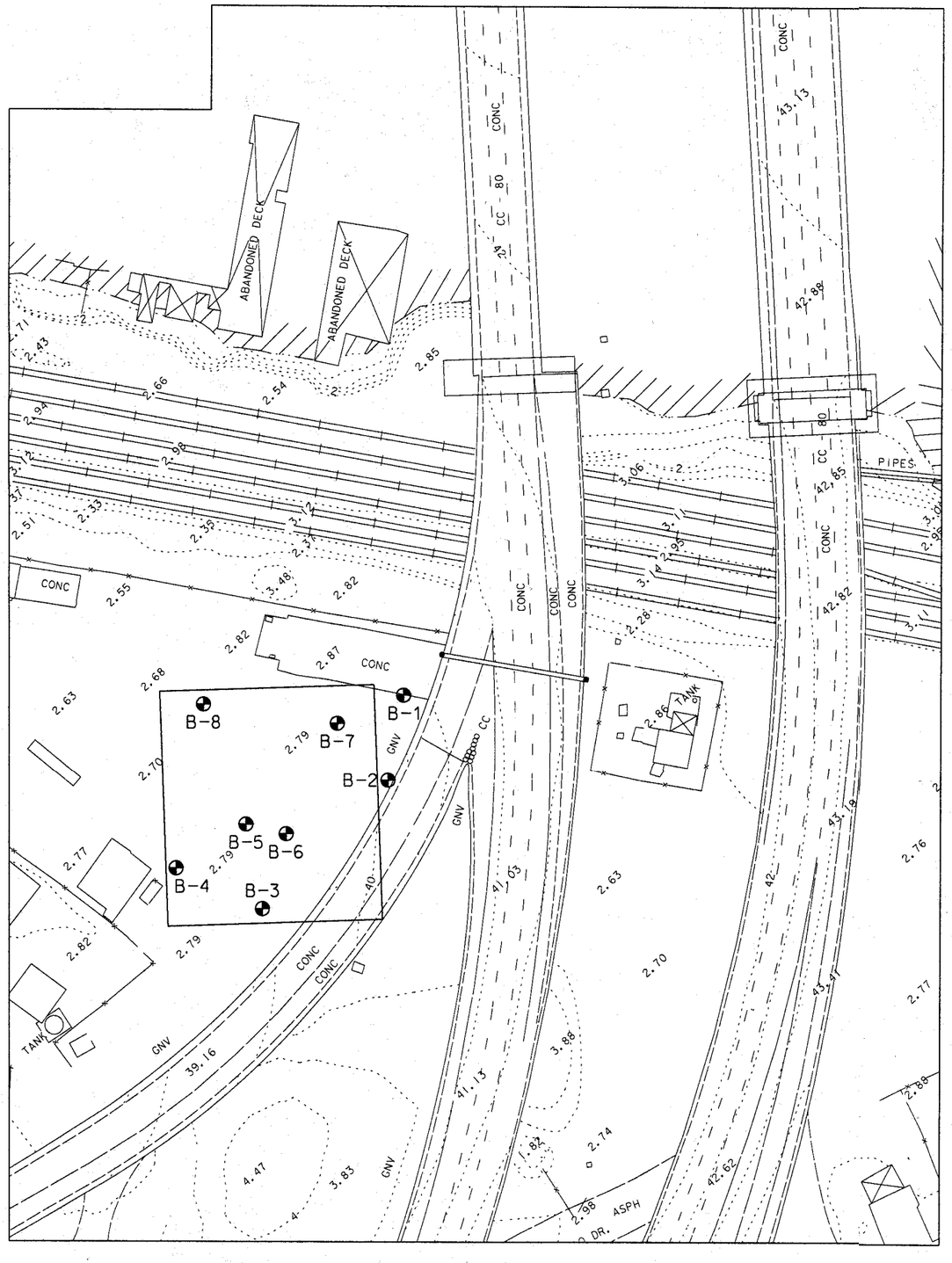
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — No. — EXP. — CIVIL — STATE OF CALIFORNIA

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

Cal-Trans now has a web site! To get to the web site, go to: http://tresc.dot.ca.gov



Soil Metal Results

Zone	Depth	Constituent	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	Classification
0 to 6 feet	0.5 feet	Pb (total) mg/kg	47	6.4	247	36	133	96	1040	29	California Hazardous (Class I)
		Pb (WET) mg/L			2.6		4.9	0.74	46		
	2.0 feet	Pb (total) mg/kg	7	11	104	19	5.2	22	38	164	
		Pb (WET) mg/L			5.1					9.6	
		As (total) mg/kg	9.6	5.7	8.1			9.6	13	7	
		As (WET) mg/L								1.1	
6 to 46 feet	6.0 feet	Pb (total) mg/kg	39*	87	6.6	12	4	15	11		Non-Hazardous (Class II)
		Pb (WET) mg/L		3.2						4	
	10.0 feet	Pb (total) mg/kg	51	50	18	43	90	15	4.4		
		Pb (WET) mg/L	1.8	2.3			ND				
	14.0 feet	Pb (total) mg/kg	12	6.3	6.1	5.9	24	15	14		
	18.0 feet	Pb (total) mg/kg	3.1		3.8	2.6	2.9			2.3	
	22.0 feet	Pb (total) mg/kg	3.3	3.8	4.8	2.9	3.1	4.4	3.5	2.7	
	26.0 feet	Pb (total) mg/kg	5.3	4.2	4.3	3.6	4.1	4.7		3	
	36.0 feet	Pb (total) mg/kg	10	3.6	5.6	4.1	6.8	5.7	5.6	5.1	
	46.0 feet	Pb (total) mg/kg	4.0		5.7	4.4	6.1	5.1	4.2		
		Se (total) mg/kg						39			

* Sample taken at 5.0 feet

Groundwater Petroleum Hydrocarbon Results

Constituent	B-1	B-5	B-6	B-7	B-8
TPH-diesel mg/L	.2	.2	.1	.2	.2

Soil Volatile and Semi-Volatile Organic Compound Results

Depth	Constituent	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8
6.0 feet	Carbon Disulfide				6.3				
	Phenol								351
10.0 feet	Acetone		93		181		98		
	Methylene Chloride				57				83
14.0 feet	Acetone		56		97	184			6.1
	Carbon Disulfide							56	5.8
	Methylene Chloride								
18.0 feet	Acetone				96	111			
	Carbon Disulfide					12			
	Methylene Chloride					87			
	Phenol								470
22.0 feet	Acetone		359		78	167	53	247	
	Carbon Disulfide				5.3				
	Methylene Chloride							54	
	Phenol							670	
26.0 feet	Acetone		144	54	183	271			93
	Carbon Disulfide					5.5			
	Methylene Chloride								
	Phenol				440				590/670
36.0 feet	Acetone		100	54		163	7.1		138
	Carbon Disulfide				57	55			16
	Methylene Chloride				65	54			
	Phenol				520	450			520
46.0 feet	Acetone	1200/3500					64		

Results reported in ug/kg

BORING LOCATIONS WITH SIGNIFICANT LAB RESULTS SOUTH ANCHORAGE

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans
SITE INVESTIGATION

PROJECT ENGINEER

DATE	REVISED BY	DATE REVISED

CALCULATED/ DESIGNED BY

CHECKED BY

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS 0 20 40 60 80

USERNAME => T4NPASC
DGN FILE => SANCH

CU 00000

EA 013031

LAST REVISION 00-00-00 DATE PLOTTED => @DATE

FIGURE 5

BORING LOCATION PLAN WITH SIGNIFICANT LABORATORY RESULTS NORTH ANCHORAGE

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	CC SOL	80	20.6/22.7 9.0/3.5		

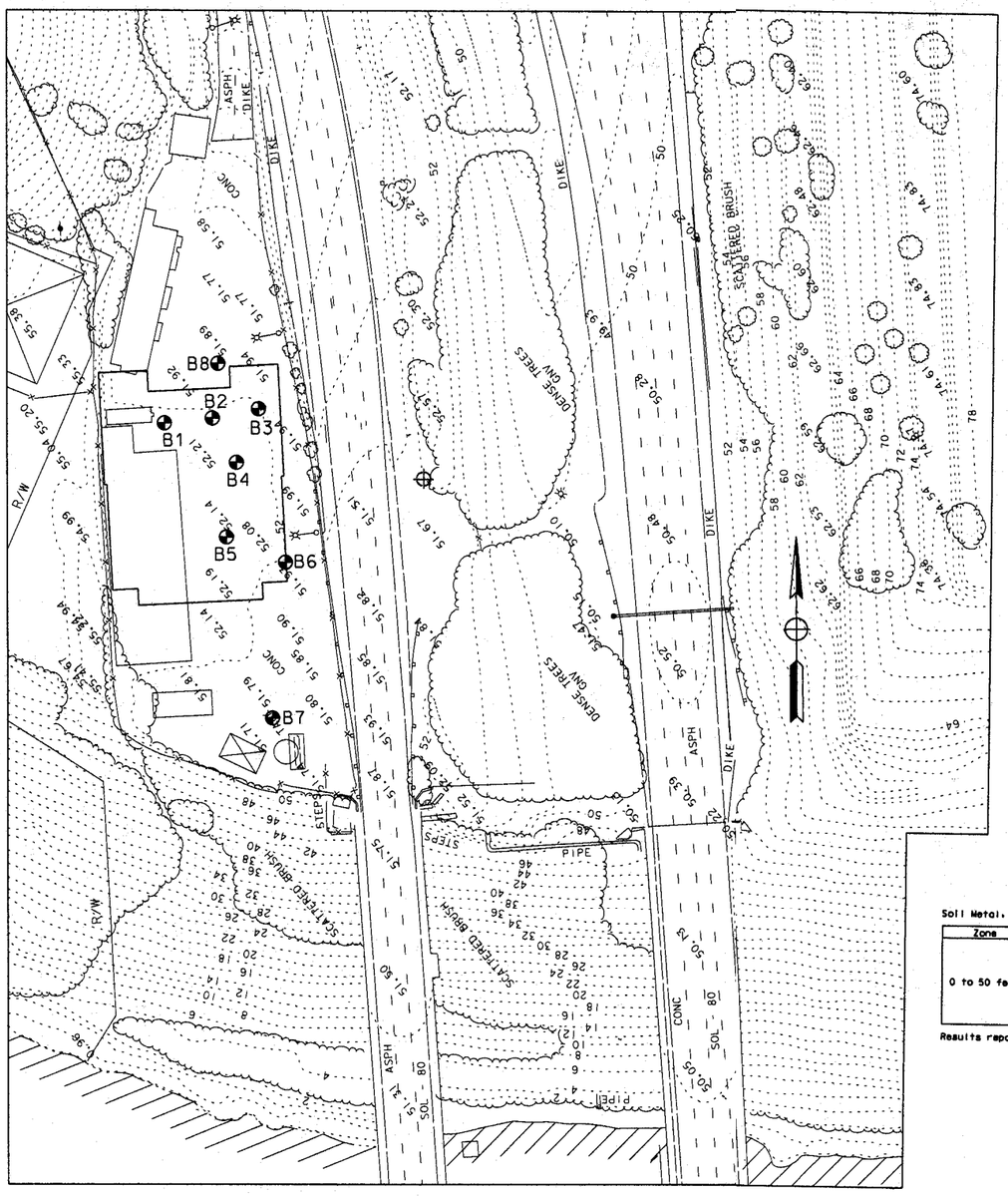
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

Cal-Trans now has a web site! To get to the web site, go to: http://trasc.dot.ca.gov

REGISTERED PROFESSIONAL ENGINEER — NO. — EXP. — CIVIL — STATE OF CALIFORNIA



Soil Metal, Volatile and Semi-Volatile Organic Compound Results

Zone	Depth	Constituent	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	Classification
0 to 50 feet	2.0 feet	Cr (total) mg/kg	32	48	39		40	43	41	124	Non-Hazardous (Class II)
		1,1-Dichloroethene		5.2							
		Acetone						99			
	6.0 feet	Xylenes (total)								299	
	20.0 feet	Acetone						56.57			
	40.0 feet	Acetone		54							
	50.0 feet	Acetone					474				

Results reported in ug/kg unless indicated

BORING LOCATIONS WITH SIGNIFICANT LAB RESULTS NORTH ANCHORAGE

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans
SITE INVESTIGATION

PROJECT ENGINEER

	DATE	REVISED BY	DATE REVISED
CALCULATED/ DESIGNED BY			
CHECKED BY			

LAST REVISION 00-00-00 DATE PLOTTED => DATE TIME PLOTTED => TIME

FOR REDUCED PLANS/RIGINAL SCALE IS IN MILLIITERS 0 20 40 60 80

USERNAME => T4NPASC
DGN FILE => NANCH

CU 00000

EA 013031